

The Nucleus:

The nucleus is a membrane bound structure that contains the cell's hereditary information and controls the cell's growth and reproduction.

It is commonly the most prominent organelle in the cell.

Distinguishing Characteristics:

The nucleus is bounded by a double membrane called the nuclear envelope. This membrane separates the contents of the nucleus from the [cytoplasm](#).

The envelope helps to maintain the shape of the nucleus and assists in regulating the flow of molecules into and out of the nucleus through nuclear pores.

[Chromosomes](#) are also located in the nucleus.

When a cell is "resting" i.e. not [dividing](#), the chromosomes are organized into long entangled structures called [chromatin](#) and not into individual chromosomes as we typically think of them.

The Nucleolus:

The nucleus also contains the [nucleolus](#) which helps to synthesize [ribosomes](#).

The nucleolus contains nucleolar organizers which are parts of chromosomes with the genes for ribosome synthesis on them. Copious amounts of RNA and proteins can be found in the nucleolus as well.

The nucleus controls the synthesis of proteins in the cytoplasm through the use of [messenger RNA](#). Messenger RNA is produced in the nucleolus of the cell and travels to the cytoplasm through the pores of the nuclear envelope.

Chromosomes

Chromosomes are the things that make organisms what they are. They carry all of the information used to help a cell grow, thrive, and reproduce. Chromosomes are made up of **DNA**. Segments of DNA in specific patterns are called **genes**. Your genes make you who you are. You will find the chromosomes and genetic material in the [nucleus](#) of a cell. In [prokaryotes](#), DNA floats in the cytoplasm in an area called the **nucleoid**.

Loose and Tight

Chromosomes are not always visible. They usually sit around uncoiled and as loose strands called **chromatin**. When it is time for the cell to [reproduce](#), they condense and wrap up very tightly. The tightly wound DNA is the chromosome. Chromosomes look kind of like long, limp, white hot dogs. They are usually found in pairs.

Completing the Sets

Scientists count individual strands of chromosomes. They count individuals not every organism has pairs. You probably have 46 chromosomes (23 pairs). Peas only have 12. A dog has 78. The number of chromosomes is NOT related to the intelligence or complexity of the creature. There is a crayfish with 200 chromosomes. Does that make a crayfish five times smarter or more complex than you are? No. There are even organisms of the same species with different numbers of chromosomes. You will often find plants of the same species with multiple sets of chromosomes.

Chromosomes work with other **nucleic acids** in the cell to build proteins and help in cell division. You will most likely find **mRNA** in the nucleus with the DNA. **tRNA** is found outside of the nucleus in the [cytosol](#). When the chromosomes are visible, cells with two complete sets of chromosomes are called **diploids** (46 in a human). Most cells are diploid. Cells with only one set (23 in a human) are called haploid cells. **Haploids** are most often found in cells involved in sexual reproduction such as a sperm or an egg. Haploid cells are created in cell division termed [meiosis](#).